



Biomass to Energy in Tennessee

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Genera Energy LLC

Tennessee's Biofuels Initiative



Energy Crop Supply Chain

Demonstrate the establishment of a dedicated biomass energy crop supply chain with farmer

UT AgResearch **UT** Extension

Biofuels, Bioproducts R&D

Establish premier RD&D capabilities and capacity in biofuels and bioproducts



Commercialization

Develop a viable, sustainable, long-term path to commercialization of cellulosic biofuels in Tennessee



Cellulosic Ethanol Biorefinery

Demonstrate the pre-commercial production of ethanol from switchgrass



\$70.5 Million
State Commitment

Introduction to Genera Energy LLC

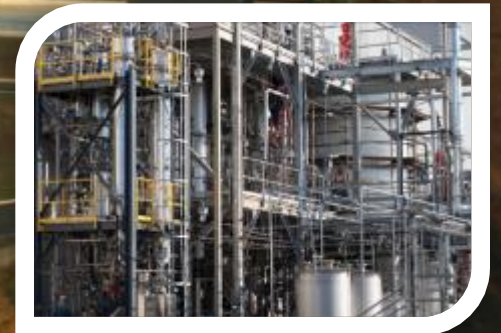
- Deliver integrated biomass supply chain solutions
- Private for-profit limited liability company, formed in 2008
 - Wholly owned subsidiary of UT Research Foundation
- Manage and implement \$70.5 million Tennessee Biofuels Initiative
 - A first-of-kind comprehensive switchgrass-to-ethanol demonstration program
 - Integrates large-scale switchgrass production with cellulosic ethanol biorefinery
 - Cellulosic ethanol biorefinery in Vonore, Tennessee
 - Biomass Innovation Park in Vonore, Tennessee
 - Developed key research and technology partnerships to build commercial industry
- Research and business partners across the industry value chain
 - DuPont Danisco, University of Tennessee, Oak Ridge National Lab (BESC), Bamert Seed, Ceres Inc., various equipment manufacturers
- Launched Genera Capital LLC in 2010 to raise targeted investment capital
- Recognized in 2010 by Biofuels Digest as one of the Top 100 Companies in Bioenergy
 - Recognized in 2010 with industry's Feedstock Development Project of the Year award



Cellulosic Ethanol Biorefinery



- Vonore, Tennessee: Niles Ferry Industrial Park, Monroe County, 32 acre site
- Started operations January 2010
- Collaboration between Genera and DuPont Danisco (DDCE)
- 250,000 GPY demonstration-scale plant and Process Development Unit (PDU) pilot plant
- Optimized as precursor to commercial facility
- Developing process technology for cellulosic ethanol
- Development work being done on multiple feedstocks
- Long-term operation as RD&D facility



Saccharification & Fermentation



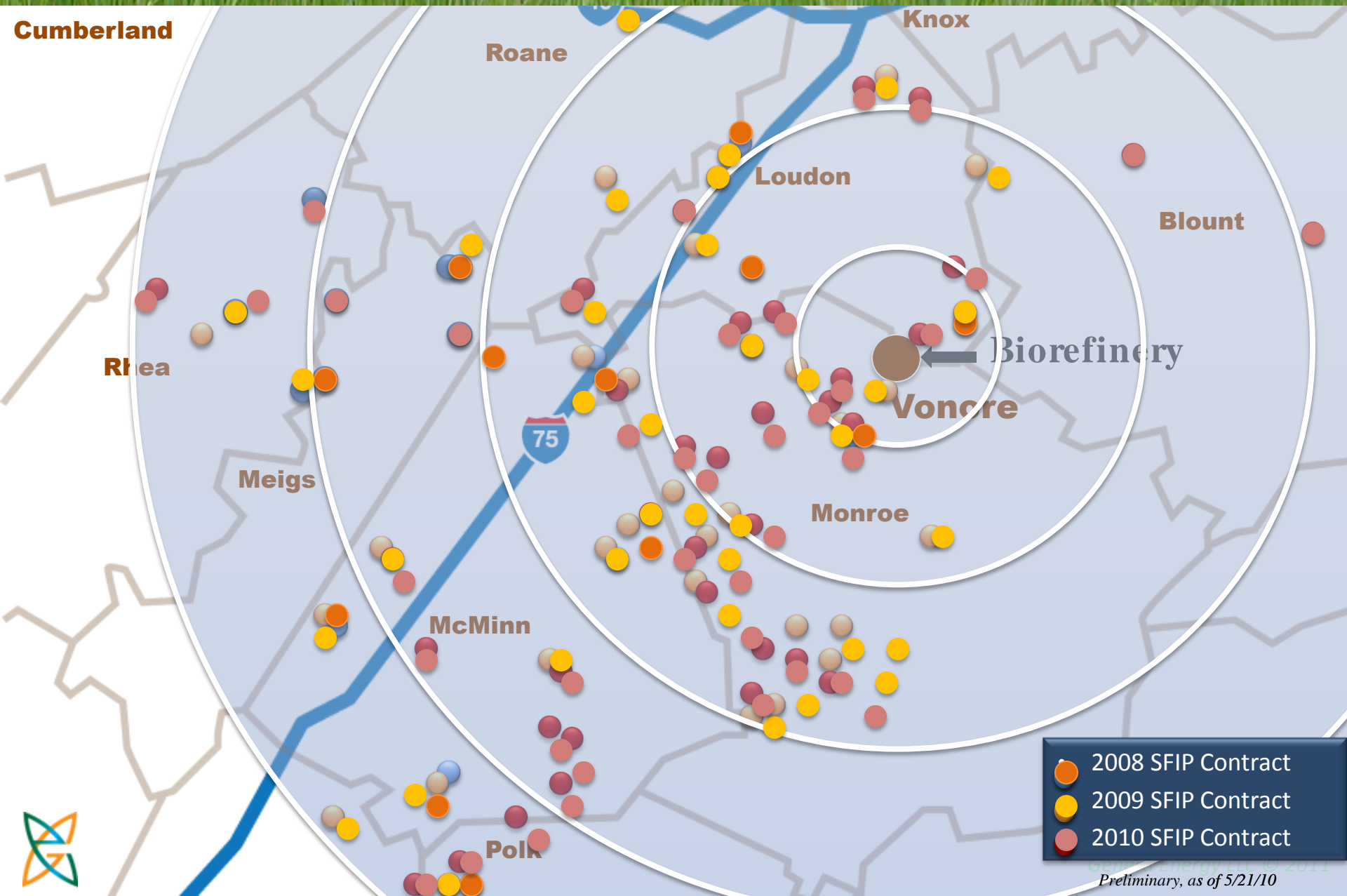
Production Experience



- Biomass production and harvesting experience with switchgrass, a native, perennial grass
- Contracting with local farmers to produce over 5,100 acres of lowland switchgrass since 2008
- UT/Genera issued incentive contracts to 61 local farmers that provide payments for establishment (inc. seed) and management of the grass over a 3 year period



Switchgrass Contract Farms



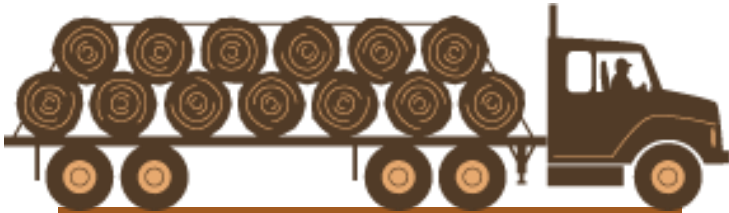
Biomass Production & Harvesting



- Crop genetics
- Improved establishment
- Technical expertise
- Tailored equipment
- Seed availability
- Risk management



Biomass Handling, Storage & Transportation



- Year-round supply
- Minimize handling
- Maximize bulk handling
- Minimize storage loss
- Maintain quality
- Manage moisture
- Increase bulk density



Biomass Preprocessing

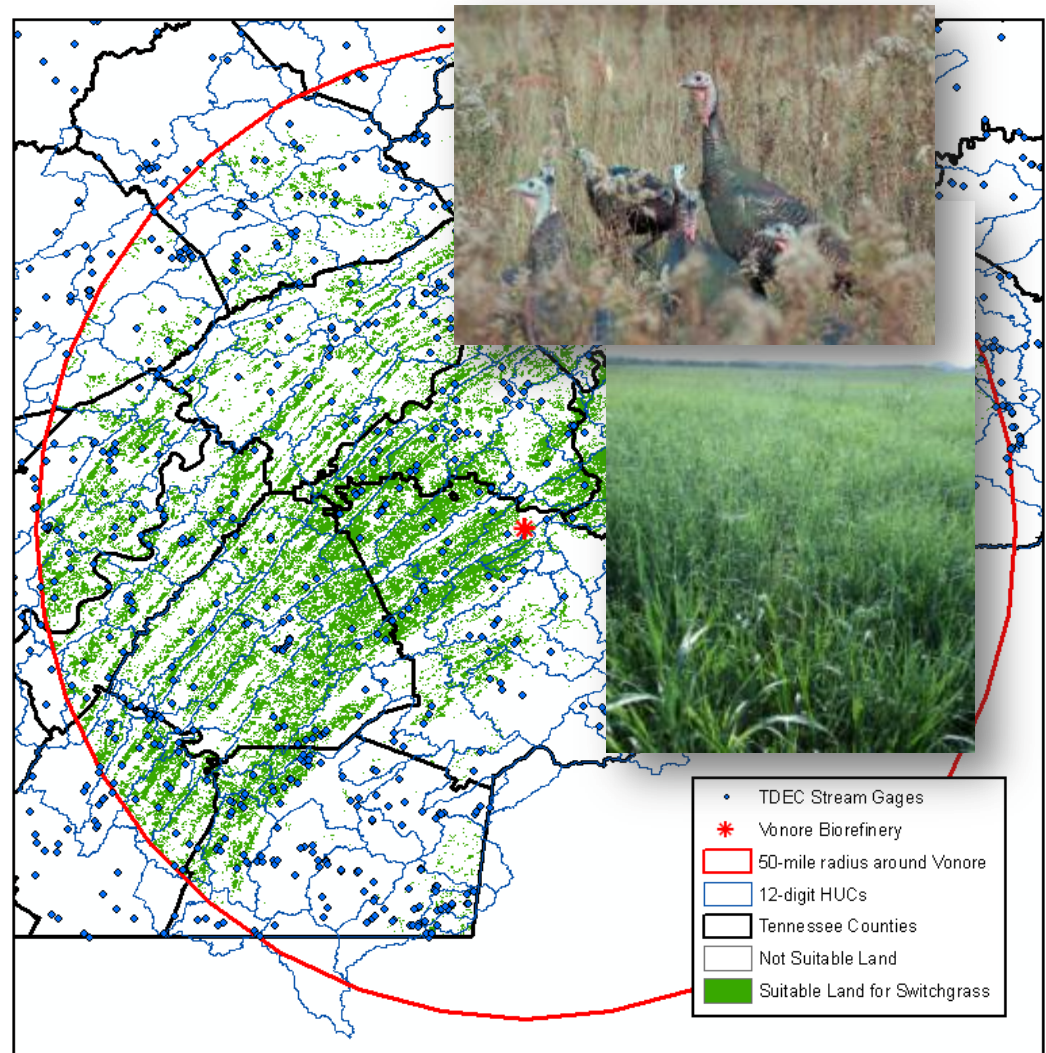


- Particle size – coarse chop to flour
- Conveyance & flowability
- Energy intensity
- New systems, systems integration
- Multiple feedstocks
- Packaging & transportation



Sustainable Biomass

- Watershed Analysis with ORNL Center for Bioenergy Sustainability
- Soil Carbon Cycling Study
- Wildlife Habitat Evaluation and Comparison
- Biochar Land Application
- Biomass Certification
 - Council on Sustainable Biomass Production



Tennessee Biomass Innovation Park

- World-class RD&D campus
- Integrates entire biomass supply chain
 - Harvest, handling, storage, densification, logistics
 - Pre-processing
 - High throughput screening and analysis
 - Agronomics, plant genetics, production
 - Intermediate processing and conversion
- Multiple feedstocks
- Site for \$5M DOE-funded high tonnage bulk handling demonstration
- Operational by end of 2011
- Strategic partnership opportunities
- Template for regional biomass depots



Conceptual Rendering: July 2010



Biomass: A Sustainable, Flexible Platform



Taking Stock of Progress.....



Demonstration Scale Biorefinery

- Constructed, now operating the country's first demonstration-scale biorefinery to convert both agricultural residues and dedicated energy crops to ethanol
- Secured more than \$70 million in private investment for biorefinery construction and commitments for ongoing operations



Energy Crops & Supply Chain

- Established the country's largest and most comprehensive program for purpose-grown energy crops, contracting with more than 60 farmers to produce more than 5,200 acres of switchgrass



World Class R&D Capacity

- Worked with UTIA researchers to leverage state investments and private partnerships to win more than \$8 million in competitive federal funds for biofuels programs (another \$50 million pending)
- Developing a world class Biomass Innovation Park to scale up and optimize biomass supply chains, including material receiving, handling, storage, pre-processing, screening, densification, and logistics (scheduled for completion in 2011)



Build a Commercial Industry

- Partnership with DuPont Danisco Cellulosic Ethanol, the country's leading developer of integrated processing technology for cellulosic ethanol
- Established the Tennessee Biomass Supply Cooperative as a model value added processing cooperative to support commercial scale up of biomass supplies in a business model that benefits local landowners and rural communities



Thank You



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